AMENDMENTS TO THE CLAIMS

1. (Original) A charged particle detection system, comprising:

(a) an electronic multiplexing unit in proximity to

(b) a plurality of charge-collecting zones,

wherein each charge-collecting zone comprises a conductive material for receiving and storing charge,

wherein each charge-collecting zone is isolated and electrostatically shielded from neighboring charge-collecting zones by a separator comprising an insulated electrical conductor held at a reference potential,

wherein each charge-collecting zone is electronically interfaced to the multiplexing unit, and

wherein the multiplexing unit is interfaced to a means for measuring the charge collected by the charge-collecting zones.

2. (Original) The system of Claim 1, wherein the multiplexing unit effects switching through sequencing using a Gray-code.

3. (Original) The system of Claim 1 having a duty cycle for charge collecting in charge-collecting zones greater than 98% for each readout cycle.

4. (Original) The system of Claim 1, wherein the separator is comprised of insulating and conducting layers.

5. (Original) The system of Claim 4, wherein the insulating layer comprises a high dielectric strength, low-leakage material.

6. (Original) The system of Claim 4, wherein the conducting layer comprises aluminum.

7. (Original) The system of Claim 4, wherein the insulating layer comprises aluminum oxide.

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8. (Original) The system of Claim 1, wherein the separator supports the charge collecting zones.

9. (Original) The system of Claim 1, wherein the conductive material comprises a metal selected from the group consisting of copper, chromium, gold, and mixtures thereof.

10. (Original) The system of Claim 1, wherein the conductive material comprises vapor deposited chromium and gold.

11. (Original) The system of Claim 1, wherein at least one charge-collecting zone comprises a Faraday cup.

12. (Original) The system of Claim 11, wherein each Faraday cup has an aspect ratio greater than about 2:1.

13. (Original) The system of Claim 1, wherein the plurality of charge-collecting zones is a Faraday cup detector array.

14. (Original) The system of Claim 1, wherein the plurality of charge-collecting zones is a linear array of Faraday cups.

15. (Original) The system of Claim 1, wherein the plurality of charge-collecting zones is a two-dimensional array of Faraday cups.

16. (Original) The system of Claim 1, wherein the plurality of charge-collecting zones comprises a stack of Faraday cups.

17. (Original) The system of Claim 1, wherein the system measures absolute ion current.

18. (Original) The system of Claim 1, wherein the system measures ion currents from about 0.2 pA to about 1.4 μA.

19. (Original) The system of Claim 1, wherein the plurality of charge-collecting zones comprises 2^n zones, wherein n is an integer greater than zero.

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20. (Original) The system of Claim 1, wherein the plurality of charge-collecting zones comprises 256 zones.

21. (Original) The system of Claim 1, wherein the a means for measuring the charge collected by charge-collecting zones is selected from an operational-amplifier and an operational-amplifier-integrator.

22. (Original) The system of Claim 1, further comprising a mask having a first surface facing the charge-collecting zones and a second surface facing outward from the charge-collecting zones, wherein the first surface is nonconductively attached to the charge-collecting zones, and wherein the second surface comprises an electrically conductive surface.

23. (Original) The system of Claim 22, wherein the mask carries a suppressor grid held at a predetermined potential.

24. (Original) The system of Claim 1, further comprising a heating means for increasing the temperature of the charge-collecting zones.

25. (Original) The system of Claim 1, further comprising a temperature control means for controlling the temperature of the system.

26. (Original) The system of Claim 1, wherein the separator, the plurality of charge-collecting zones, the electronic multiplexing unit, and the means for measuring the charge collected by charge-collecting zones are mounted on a single substrate.

27. (Original) The system of Claim 26, wherein the substrate comprises a printed circuit board having traces.

28. (Original) The system of Claim 27, wherein the traces are electrically connected to the charge-collecting zones directly.

29. (Original) The system of Claim 1, wherein the plurality of charge-collecting zones is microfabricated.

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30. (Original) The system of Claim 29, wherein the plurality of charge-collecting zones comprises a Faraday cup detector array.

31. (Original) The system of Claim 29, wherein the plurality of charge-collecting zones comprises an array of Faraday cups, each cup having a unit cell size of about 100 μm.

32-39. (Canceled)

40. (Original) A charged particle analyzer or charged particle separator, comprising:

(a) a source of charged particles;

(b) means for forming a beam of charged particles; and

(c) means for directing the beam onto a charged particle beam detection system, wherein the charged particle beam detection system comprises:

(i) an electronic multiplexing unit in proximity to

(ii) a plurality of charge-collecting zones,

wherein each charge-collecting zone comprises a conductive material for receiving and storing charge,

wherein each charge-collecting zone is isolated and electrostatically shielded from neighboring charge-collecting zones by a separator comprising an insulated electrical conductor held at a reference potential,

wherein each charge-collecting zone is electronically interfaced to the multiplexing unit, and

wherein the multiplexing unit is interfaced to a means for measuring the charge collected by the charge-collecting zones.

41. (Original) The analyzer of Claim 40, wherein the detection system further comprises a mask having a first surface facing the charge-collecting zones and a second surface facing outward from the charge-collecting zones, wherein the first surface is nonconductively

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attached to the charge-collecting zones, and wherein the second surface comprises an electrically conductive surface.

42. (Original) The analyzer of Claim 41, wherein the mask carries a suppressor grid held at a predetermined potential.

43. (Original) The analyzer of Claim 40, wherein each charge-collecting zone comprises a Faraday cup.

44. (Original) The analyzer of Claim 40, wherein the plurality of charge-collecting zones comprises a Faraday cup detector array.

45. (Previously presented) A charged particle analyzer comprising the ion beam detection system according to Claim 1.

46-88. (Canceled)

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